Chapter - I

INTRODUCTION

A dye is a coloured substance that can be applied in solution or dispersion to a substrate, thus giving it a coloured appearance. Dyes may be classified according to either their chemical constitution or method of application, viz. Azodyes, Acid dyes, Basic dyes, Reactive dyes, Disperse dyes, Direct dyes etc., and used for dyeing, printing or as pigments. Since some of the earliest synthetic dyes were obtained from aniline and aniline was known to be a constituent of coal-tar, such dyes were loosely called 'aniline dyes' or 'coaltar dyes'. Resonably pure chemical substances used as raw materials for the manufacture of dyes are called 'primaries'. The most important of them are benzene, toluene, the xylenes, phenols, cresols, naphthalene, anthracene, carbazole etc. Most of the intermediates entering into the preparation of dyes are members of aromatic series. The substituents most frequently present are methyl, halogen (usually chlorine), nitro, amino, hydroxy, alkoxy, sulfo, carboxy and (in some cases) aldehyde and ketone groups - the latter also in the form of quinone groups.

Some of the intermediates have been found toxic and hazardous to human health, e.g. Benzidine, β-naphthylamine, p-aminodiphenyl, p-nitrodiphenyl etc. and can no longer be manufactured. In addition, numerous colourants, based on such intermediates have been banned from use by the food and

cosmetic industries. These limitations led to the introduction of some new intermediates and dyes, and replacement for the toxic dyestuff intermediates. Certain molecular modifications of some known carcinogens also led to significant lowering or removal of toxicity.

The development of new structures of dyes and intermediates has been a continuous process over a period of several years and many novel structures of dyes and intermediates have been discovered. This development may be due to the new invensions and knowledge of organic chemistry, heterocyclic chemistry, possibilities of obtaining new intermediates from petroleum sources, requirement of better physical properties; improved dyeing and fastness properties of the organic colourants, to avoid use of hazardous colourants; increasing nontextile uses of organic colourants and many more. In developing new structures of organic colourants which possess suitable chromophoric systems, newer chromophoric systems have been discovered. The new chromophoric systems developed in recent years can be categorized as azo chromophores, styryl chromophores, fluorescent dyes and pigments, disperse dye chromophares, cationic dye chromophores, cyanine dye chromophores and many more[1].

The development of new structures of disperse dyes has been a subject of interest and many novel structures of these

dyes useful in application to polyester, polyamides or polyacrylic fibres have been discovered. In recent years many heterocyclic systems have found a valuable place in producing novel structures of dyes and intermediates, as the diazo components or couplers. These may be amino or hydroxy group containing heterocyclic systems. An extensive survey of recent literature shows that a number of heterocyclic intermediates have been introduced as the diazo components or couplers in the synthesis of dyes, e.g. pyridine, pyrimidine, thiophene, thiazole, imidazole, thiadiazole, quinoline, quinazoline, pyrrole, pyrazole etc.

The Important amino compounds used as diazo components or couplers are derived from following heterocycles (1) pyridine, (2) pyrimidine, (3) thiophene, (4) thiazole, (5) pyrazole. A number of dyes have been synthesised from suitably substituted aminopyridine, aminothiophene, aminothiazole and aminopyrazole intermediates. Among the pyrimidine derivatives, halogenated pyrimidines (chloro, fluoro) have been found to be important intermediates for the synthesis of reactive dyes, and barbituric acid has been found to be an important intermediate for the synthesis of dyes and pigments. A Little work has been done on the amino or diamino pyrimidines as intermediates for dyes. As most of them are found to have biological activity, they are widely used for the synthesis of drugs.

Aminopyrimidines may be coupled with diazotized amines to give 5-aryl azo dyes. Although, the colour range of the monoazo dyes thus obtained are restricted to yellow through orange, it is possible to extend the range to red by using aminoazo benzene derivatives as diazonium salts. The simple amino and diamino pyrimidines used as couplers are 4-amino-1,3-N,N-dialkylpyrimidine-2,6-diones; 2,4,6-tri-N,N-dialkylaminopyrimidines, substituted 2,4-diamino pyrimidines and substituted 4,6-diamino pyrimidines.

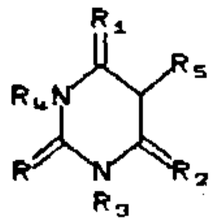
Review of the Literature

A brief review on the synthesis and application of the azo pyrimidine dyes has been done. Johnson et al. reported the formation of diazo uracil-anhydride from aminouracil and coupled with α-naphthol to yield a red brown dye which produced a bright red shade on silk[3]. Bogert et al. have reported the formation of azo derivatives of the pyrimidines with particular reference to derivatives of uracil, which include (a) coupling of aromatic diazonium salts with pyrimidine phenols (b) coupling of diazo uracil with aromatic phenols and amines (c) coupling of diazo uracil with pyrimidine phenols and some condensation reactions of hydrazine salts with substituted pyrimidines to form azo derivatives of pyrimidines[4]. Todd et al. have reported the coupling reaction of pyrimidine derivatives with diazonium salts, and confirmed the introduction of azo substituents in

position-5,and also made the structural conditions governing the coupling of pyrimidine derivatives and their relation to those governing nitrosation[5]. Many examples are known and the best conditions under which the coupling occurs have been surveyed[6,7].

The present review deals with the synthesis, properties, spectral data and applications of different pyrimidine derivatives as dyes or as pigments. The data on the literature of last 15 years are presented in Tables 1-7.

Table 1 : Barbituric Acid & derivatives



S. No.	R	R^1	R^2	R^3	R^4	R^5	Properties	Colour and Spectral data	Uses	Ref.
1.	-Oxo	-Oxo	-Oxo	-H	-H	-(un)substituted fused pyrimidine derivs.	--	Brown	As pigments	8
2.	-Oxo -Thio- -cyani- mino	-Oxo	-Oxo -Amino	-H	-H	-(un)substituted 2(4-phenylazo)-2H naphtho [-1,2-d]triazole-5-sulfonate	-Produces bright yellow shades with high build up on paper and polyamide fibres. - Produces fluorescent greenish yellow shades on paper.	Yellow	Anionic azo-dyes;- Reactive Azo dyes.	9,29, 32,50
3.	-Tetrazole-residue -Oxo	-Oxo	-Oxo	-H $-C_{1-4}$ alkyl-Aralkyl; (un)substituted phenyl	-H $-C_{1-4}$ alkyl; Aralkyl; (un)substituted phenyl	-(un)substituted 4-(6-methyl-7-sulpho-2-benzothiazolyl)-phenylazo	Produces bright yellow shades with high buildup and good fastness on paper	Yellow	Basic Azo dyes	10,11, 15,35, 38,62
4.	-Oxo -Thio -Amino -Cyanimino	-Oxo	-Oxo	-H $-C_{1-6}$ alkyl C_{5-6}-Cycloalkyl; C_{6-10} aryl; Benzyl; phenyl	-H $-C_{1-6}$ alkyl; C_{5-6}-Cycloalkyl; C_{6-10} aryl; Benzyl; phenyl	-(un)substituted iminoiso-indoline intermediates	-Produces brilliant yellowish-red shades on polyethylene having good light and weather stability -Produces yellow shades on plastics, lacquers and varnishes	Yellow, Red, Greenish black	Pigments	12,13,14, 24,31,34, 39,46,47, 48,49,51, 52,53,54, 55,57,58, 64

5.	-Oxo	-Oxo	-Oxo	-H	-H	--	Shows good water solubility, low foaming and low corrosivity to dyeing application	--	Anionic azo dye	16
6.	-Oxo	-Oxo	-Oxo	-Methyl	-Methyl	-Dihydroxy-quino line ring contg. Ni^{2+}, Cu^{2+} Co^{2+}, Zn^{2+}, Mn^{2+} or Fe^{2+} complexes	Produces yellow colour to polypropylene; polymers, lacquers etc.	Yellow	Pigments	17
7.	-Propylamino--Dimethylamino	-Oxo	-Oxo	-H	-H	-4-(6-methyl-2-benzothiazolyl)-phenylazo	Produces fast shades on paper and acrylic fibres	λ_{max}: 420 nm	Basic Azo-dyes	18,37
8.	-Oxo	-Oxo	-Oxo	-H	-H	-2,5-bis-(1-methyl-2-methyl-mercaptobenzo-[c,d]-indolium-iodide cyclopenten-1-yl)-	IR absorbing and optical recording material	λ_{max} (CH_2Cl_2): 820 nm	Trimethine-dyes	19
9.	-Oxo	-Oxo	-Oxo	-H	-H	-(un)substituted-mono-, di-, tri-, tetra-, penta- hexa, or heptamines	Produces fast reddish yellow shades on paper	λ_{max} (20% ACOH in H_2O): 410 nm	Basic Azo-dyes	20
10.	-Oxo	-Oxo	-Oxo	-Methyl -Phenyl	-H	-(un)substituted-N-hetero-cyclic compds linked through methine linkage	Exhibits negative solvatochromism and weak sensitivity to acids	--	Dimethine nor-mero-cyanines	21
11.	-Oxo	-Oxo	-Oxo	-H	-H	-(un)substituted barbituric acid-azo-residue	--	--	--	22

12.	-Oxo -Thio- -Amino- -cyani- mino	-Oxo -Amino- $-C_{1-4}$- alkyl- amino	-Oxo -Amino- $-C_{1-4}$- alkyl- amino	-H -(un)substi- tuted alkyl; (un)substi- tuted phenyl	-H -(un)substi- tuted alkyl; -(un)substi- tuted phenyl	-Substituted-p-Amino-azo benzene derivatives	Produces yellow-orange shades on paper, leather, rayon and acrylic fibres	Yellow or Orange	Cationic disazo dyes	23
13.	-Oxo	-Oxo	-Oxo	-H	-H	-Substituted phenylazo	Dyes polyamide fibres	-	Disperse Reactive dyes	25
14.	-Oxo	-Oxo	-Oxo	-H	-H	-Substituted 2-(4-phenyl azo)-6-benzoxazole sulphonic acids	Produces fast greenish yellow shades on paper	Yellow	Azo dyes	26
15.	-Oxo	-Oxo	-Oxo	-Substituted phenyl	-H -2-benzimidazolyl methyl; -2-(thioxo-benzoxazolinyl) methyl	-Substituted phenylazo	Shows plant antiviral activity and antiinflammatory activity	--	Drugs	27
16.	-Oxo	-Oxo	-Oxo	-H	-H	-4-phenylazo-4'-methine-1-methylpyridiniumchloride	Produces yellow colour on paper and acrylonitrile	Yellow	Methine azo dyes	28
17.	-Hydroxy	-Hydroxy	-Hydroxy	-	-	-Substituted phenylazo metal complexes	Produces fast red-brown shades on wool and polyamide fibres	λ_{max} : 532 nm	Metal complex disazo dyes	30
18.	-Oxo	-Oxo	-Oxo	-Methyl	-Methyl	-(un)substituted 4'-dialkyl amino terephthalylidene rhodanines	Produces fast shades on polyester fibres	λ_{max} 85% aq. Acetone): 617 nm	Disperse styryl dyes	33

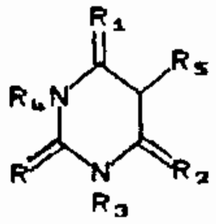
19.	-Oxo -Thio	-Oxo	-Oxo	-H -Methyl	-H -Methyl	-5,5'-bis(methine)barbituric acid and metal complexes	Forms cryst. dye aggregates with cyanine ions. Also undergo inter mol. solid state reactions. Also have the properties of colouration of soft PVC with light and migration fastness	--	Cyanine dyes and pigments	36.56
20.	-Oxo	-Oxo	-Oxo	-Dodecyl	-Ethyl-	-2,5-bis(methine)[2(2-acetanilidovinyl)-3-ethyl benzothiazolium-iodide) cyclopentene-1-yl	Produces photographic film coatings. Near IR absorbing material	--	Cyanine dyes	40
21.	-3-methine-2-ethyl-1 phenyl-4.5 -di-oxopyrazoline	-Oxo	-Oxo	-H	-H	-Diethyl	Exhibits bacteriostatic and fungistatic activity	-	Cyanine dyes	41
22.	-Oxo -cyanimino	-Oxo	-Oxo	-H	-H	2-cyaniimino-barbituric acid azometal complexes	Produces clear orange shades on lacquers and plasters. Produces yellowish brown coatings and yellowish orange dyeings	Orange; yellowish-brown; Green	Pigments	42.43, 44.45
23.	-Oxo -Thio	-Oxo	-Oxo	-H	-H	-o-cyanide substituted methine-p-dialkylamino benzene	Useful as photographic tilted dyes	Violet to deep blue λ_{max} (H_2O): 580 nm	Styryl dyes	59.60
24.	-Oxo	-Oxo	-Oxo	-H	-H	-Alkylsulfonyl; alkoxy-sulfonyl residues		--	Dye intermediates	61

25. -Oxo	-Oxo	-Oxo	-Ethyl -phenyl	-3-chlorophe-nyl; methyl; ethyl; phenyl	-Substituted Naphtholac-tam residue	Light and sublimation fast dyes	Red	Naphtholactam dyes	63,70
26. -Oxo	-Oxo	-Oxo	-H	-H	-3-Nitro-4,4'-disazo-bi-phenyl	Produces level fast strong yellow shades with good fastness characteris-tics on cellulose textiles from dye baths contg. a mix. of polar and non-polar organic solvents	Yellow	Disperse azo dye	66
27. -Oxo	-Oxo	-Oxo	-H	-H	-4-Azomethine-5'-chloro-2.5-dimethyl-2'-methyl-azo-benzene	Used for colouring plastics, printing inks and coatings with good light fastness	Bluish yellow	Monoazo-methine-pigments	65
28. -Oxo	-Oxo	-Oxo	-Cyclohexyl	-3(2-sulfamoyl)-phenyl	-5'-Methine-bis-1-cyclo-hexyl-3-(2-sulfamoyl phenyl) barbituric acid.	Nondiffusible dyes, useful as anti-halation agents or filters in photog. film	-	Photographic dyes	67,78
29. -Oxo	-Oxo	-Hydroxy	--	-H	-Amino	Use of α-naphthol as coupler with 5-amino barbituric acid at pH 9.5 and treatment of grey hair, developes a smoke blue colour when oxidized with air	-	Hair dye developer	68
30. -Oxo -Amino -Thio	-Hydroxy	-Oxo -Amino	-H	-H	-(un)substituted 1-Azo-methine anthraquinone	Produces yellow to orange shades on plastics, coatings, with good fastness. Also used in printing inks	Yellow to Orange	Azo methine-pigments	69

1 (19)

31.	-Oxo	-Oxo	-Oxo	-H	-H	-Substituted aminomethyl quinolones	Produces fast, deep, clear yellow shades on PVC	Yellow	Monoazo-dyes	71
32.	-Oxo	-Oxo	-Oxo	-H	-H	-Halogenated phenylazo	Exhibits fastness properties better than toluidine yellow pigments	Yellow	Azo dyes	72
33.	-Oxo -Thio -Amino	-Oxo -Amino	-Oxo	-H	-H	-Bisazomethine linkage having any divalent aryl or heterocyclic radical	With Zn stearate 0.5% in polyethylene produces a heat stable greenish-yellow molded product. Also suitable as a non-bleeding pigment in melamine alkyd. coatings	Greenish yellow	Bisazomethine pigments	73,74
34.	-Oxo	-Oxo	-Oxo	-H	-H	-Tetrazotized-4,4'-diamino-2-methylazo-benzene	Produces orange to red shades on PVC, Polyesters. Also used as printing inks	Orange to Red	Azo dyes	75
35.	-Oxo	-Oxo	-Oxo	-H	-H	-Substituted diphenyl ether azo	Produces a fast yellow dyeings and printings on polyester fibres	Yellow	Azo dyes	76
36.	-Oxo	-Oxo	-Oxo	-H -Methyl,phenyl. -3-chloro-phenyl	-Methyl	-Substituted benzanilide-azo	Produces fast orange to red shades on PVC	Orange to Red	Pigments	77

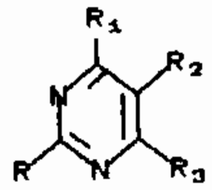
Table 2 : Thiobarbituric Acid & derivatives



S. No.	R	R^1	R^2	R^3	R^4	R^5	Properties	Colour and Spectral data	Uses	Ref.
1.	-Thio	-Oxo	-Oxo	-Butyl	-Butyl	-Substituted Benzoxazole residues linked through methine linkage	Useful in the photochem. inactivation of pathogenic viruses and leukemia cells	λ_{max} (MeOH) = 560 nm	Fluorescent Merocyanines	79
2.	-Thio	-Oxo	-Oxo	-Substituted aryl	-Aryl	-Substituted phenylazo	Exhibits bactericidal and fungicidal activity	--	--	80,85
3.	-Thio	-Oxo	-Oxo	-H -Methyl	-H -Methyl	-p-methoxy- and dimethy-lamino-benzylidene-cinnamylidene-, phenyl-penta dienylidene	--	--	--	81
4.	-Thio	-Oxo	-Oxo	-Substituted aryl	-Substituted o-chloro-phenyl	-Substituted phenylazo	Exhibits antitumor activity in mice	--	Antineoplas-tic agents	82,84
5.	-Thio	-Oxo	-Oxo	-H	-H	-5'-methine barbituric acid sodium salt	Produces light and migration fast reddish-yellow shades on high molecular weight organic materials e.g. PVC	Yellow	Pigments	83

	6. -Thio	-Oxo	-Oxo	-Ethyl	-Ethyl	-(un)substituted benzo-pyrazinoimidazoles linked through methyne linkage	Useful as sensitizers in S- and Au-sensitized silver bromoiodide emulsions	--	Cyanine & Merocyanine dyes	86,87
13	7. -Thio	-Oxo	-Oxo	-Ethyl	-Ethyl	-2,2'-bis-methine-benzo-thiazole-residue	--	--	Merocyanine dyes	88
	8. -Thio	-Oxo	-Oxo	-Ethyl	-Ethyl	-Substituted 5,5-dimethyl 2-cyclohexene-1-ylidene pyrrolidinium perchlorate	Exhibits sensitivity extending into the green to orange region	λ_{max} [MeOH]: 383-397 nm	Filter dyes	89

Table 3 : Triamino and Tetraamino Pyrimidine & derivatives



S. No.	R	R^1	R^2	R^3	Properties	Colour and Spectral data	Uses	Ref.
1.	-H Hydroxy	-(un)substituted amino	-H -Amino	-Hydroxy -Amino	A hair dye composition is made which comprised isatin, tetra amino-pyrimidine, Ethanol, water and Triethanolamine at pH 7.6	--	Hair dye	90
2.	-Amino	-Amino	-Amino	-Amino	A hair dye composition is made contg. (un)substituted-5,6-dihydroxy-indole, p-aminophenol, Tri (or) Tetra amino pyrimidine and H_2O_2, which dyes hair in a chestnut brown/mahogany colour.	--	Haie dye developers	91
3.	-Thio	-Amino	-Amino	-Amino	A hair dye composition is made contg. Oleic acid, Oleic acid diethanolamide, Oleyl alcohol, Polyoxyethylene Octyl dodecyl ether, Ethanol, Propylene glycol, Ammonium chloride, Ammonia, water and Triaminothiopyrimidine as developer in presence of aq. H_2O_2, which dyes hair in red colour.	--	Hair dye developers	92

4. -Amino	-Amino	-4-(6-methyl-7-sulfo-2-benzothiazolyl)-phenylazo-	Amino	Useful for dyeing of cellulosic textiles and paper. Also gives storage stable concd. dye solns.	--	Azo dyes	93
5. -Amino	-Amino	-Substituted phenylazo- -Amino	-Amino -Halo	--	--	--	94
6. -Amino	-Amino	-Substituted phenylazo- & metal salts	-Amino	--	--	1. Azo derivs. 2. Pigments	95,97, 98,100
				Produces light, migration & weathering fast yellow to red shades on PVC, lacquers and enamels			
7. -Substituted phenyl or pyridyl-	-Amino	-Amino	-Amino	--	--	Oxidative Hair dye developer	96
8. -Amino $-C_{1-4}$ alkyl, CH_2Ph; Aryl $(CH_2)_n$ R [R=OH,halo,NH_2, alkylamino, dialkylamino, N-heterocyclyl, n=1-4] -Alkoxy -Thio	-Amino $-C_{1-4}$ alkyl, CH_2Ph, Aryl;$(CH_2)_n$ R [R=OH,halo,NH_2, alkylamino, dialkylamino, N-heterocyclyl, n=1-4] -Thio	-Amino	-Amino $-C_{1-4}$ alkyl, CH_2Ph, Aryl;$(CH_2)_n$ R [R=OH, halo, NH_2, alkylamino, dialkylamino, N-heterocyclyl, n=1-4] -Morpholino -Alkoxy	1. A hair dye composition is made with 4-amino-2,1,3-benzothiadiazole or its inorg. or org. salts as coupler and Tetraamino pyrimidine as developer with 1% H_2O_2 and with NH_4OH at pH 9.5 dyes white hair yellow. 2. A hair dye composition is made with dihydroxy pyridine coupler and Tetra-amino pyrimidine developer with mixt. of fatty alcohols and fatty alcohol sulfates and 1% H_2O_2 at pH 9.5, dyes grey human hair yellow-brown or yellow.	--	Hair dye	99,101, 102,103, 104,105, 106,107, 108,109, 110,111, 112,113, 114,115, 116

1025

3. A hair dye composition is made with Resorcinol as coupler and Tetraamino pyrimidine as developer with 3% H_2O_2 at pH 10.5, dyes human hair red-brown with good colour intensity.

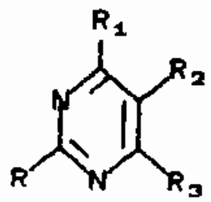
4. A hair dye composition is made with Diaminoindolines, Diamino-isatins or diamino oxo indoles as couplers and Tetraamino pyrimidine as developer with mixt. of fatty alcs. and fatty alc. sulfates with 1% H_2O_2 at pH 9.5, dyes grey human hair violet blue or violet black.

5. A hair dye composition is made with 3,3',5,5'-tetra aminobiphenyl derivs. as couplers and Tetraamino pyrimidine derivs. as developers with mixt. of fatty alcs. and fatty alc. sulfate with H_2O_2 soln. at pH 9.5, dyes grey hair brownish-yellow colour.

6. A hair dye composition is made with monohydroxy indazoles as couplers and Tetraamino pyrimidine derivs. as developers with mixt. of fatty alcs. and fatty alc. sulfate with 1% H_2O_2 at pH 9.5 dyes grey hair honey yellow colour.

				7. A hair dye composition is made with 7-hydroxy-4-me-coumarin and p-amino-phenol as coupler and Tetraamino-pyrimidine derivs. as developers with mixt. of fatty alcs. and fatty alc. sulfate with 1% H_2O_2 at pH 9.5. dyes grey hair a yellow brown colour.			
9.	-NXY[X,Y=H, aliph; cycloaliph., araliph., aryl or heterocyclic group]	-NXY [X,Y=H, aliph., cyclo aliph., aryl or hetero-cyclic group]	-Substituted 4-(phenylazo)-phenyl; phthalimidyl, anthraquinonyl, benzisothiazolyl group	NXY [X,Y=H, aliph., cyclo aliph., aryl, or heterocyclic group]	Produces light and wash fast yellow dyeings and printings on cotton-polyester fabrics	Yellow	Azo dyes	117
10.	-NHX [X=C_{1-6} alkyl, cycloalkyl]	-NHX [X=C_{1-6} alkyl, cycloalkyl]	-Substituted phenylazo-	-NHX [X=C_{1-6} alkyl, cycloalkyl]	Produces fast yellow shades on polyester and polyamide fibres	Yellow	Disperse dyes	118
11.	-Arylamino-	-Arylamino-	-(2-carboxy hydroxy- or mercapto-phenyl-azo) metal complexes	-Arylamino	--	--	Azo pigments	119

Table 4 : 2,4-Diamino-pyrimidine & derivatives

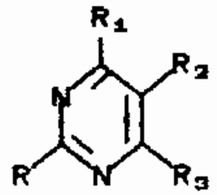


S. No.	R	R^1	R^2	R^3	Properties	Colour and Spectral data	Uses	Ref.
1.	-Amino	-Amino	-p-bromophenylazo -p-iodophenylazo -p-ethoxyphenylazo -p-methoxyphenylazo -p-sulfamoyl-phenyl-azo -p-methylphenylazo -p-nitrophenylazo -benzene-p-sulfonic acidazo -p-chlorophenylazo -phenylazo- -phenylazo-p'-carboxylic acid	-p-ethoxyphenyl-amino -p-bromophenylamino -p-chlorophenylamino -p-sulfamoylphenyl-amino -p-sulfonic acid phenylamino- -p-nitrophenylamino -p-aminobenzoic acid	Tested inactive against murine lymphocytic leukemia p-388	--	Anticancer Agents	120,121 122
2.	-Amino	-Amino	-p-iodophenylazo- -o-methoxyphenylazo- -p-methylphenylazo -p-bromophenylazo- -m-methylphenylazo -p-methoxyphenylazo -phenylazo-p-carboxylic acid	-Cyclohexylamino- -Morpholino; Piperidino -p-iodophenylamino- -p-methoxyphenylamino -Methyl	Inhibit the growth of S. Faecalis and act as folic acid antagonists	--	Folic Acid Antagonists	123,126, 129

3. -Amino	-Amino	-2-(4-aminophenyl-azo)-6-methyl-7-benzothiazole sulfonic acid -	-Hydroxy	Produces yellow shades on paper, leather &-OH or N-contg. textiles	Yellow, λ_{max} (H_2O): 413 nm	Monoazo dyes	124,125
4. -C_{1-6} alkylamino -Alkenylamino- -Cyclohexylamino-	-C_{1-6} alkylamino- -Alkenylamino- -Cyclohexylamino-	-o-cyanosubstituted phenylazo;alkyl, alkenyl, acyl, halogen, nitrosub stituted phenylazo-	-H -C_{1-3}-alkyl Alkenyl, Cyclohexyl-	With ethylcellosolve and 9:1-mix. of EtOH-ethylene glycol, applied to transfer paper which was used to print polyester fabric in a greenish-yellow shades of good light and wash fastness	Greenish-yellow	Disperse azo dyes	127,128
5. -Amino	-Amino	-2-(methylsulfonyl)-4-nitrophenylazo	-Hydroxy	Produces brilliant, deep orange shades with good fastness properties on lacquers	Orange	Pigments	130

28)

Table 5 : 4,6-Diaminopyrimidine & derivatives



S. No.	R	R^1	R^2	R^3	Properties	Colour and Spectral data	Uses	Ref.
1.	-3-(7-dialkylamino) coumarin	-Amino	-H -Halo	-H -Alkyl -Amino	Produces golden yellow shades on polyacrylonitrile fibres	Yellow λ_{max} = 460 nm	Dyes	131
2.	-(un)substituted phenyl; (un)substituted aromatic heterocyclic residue	$-NH(CH_2)_3OSO_3H$	2-(4-aminophenyl-azo sulfonyl)-ethyl-H-sulfate-	$-NH(CH_2)_3OSO_3H$	Produces fast golden yellow shades on cellulose fibres	Yellow	Reactive azo dyes	132
3.	-Phenyl	-NH-A' A'=Vatdyechromophore	-H	-NH-A^2 A^2=Vatdyechromophore	Produces violet shades on cotton. Also used for colouring lacquers, and dyeing and printing of natural and regenerated cellulose textiles	-	Vat dyes	133

4. -Ethyl	-[[2-(acryloyloxy ethyl]amino]	-Substituted phenyl azo	-[[2-(acryloyloxy) ethyl]amino]	Produces golden yellow printings and continuous dyeings on polyester and cotton fabrics with good fastness to light, heat and water	Yellow	Polymeric dyes	134
5. -Ethyl	-[[β-(acryloyloxy ethyl]amino]	-Substituted phenyl azo	-[[β-(acryloyloxy) ethyl]amino]	Produces golden yellow printings on polyester, cotton, paper with excellent fastness to light, heat and wet treatments	Yellow	Polymeric dyes	135
6. -H	-Amino	-6-chloro-benzo[a] 9,11-diazapheno-thiazine-5-one	-	Produces light and wash fast orange shades on cotton and polyester	Bluish purple-Orange	Vat dyes	136
7. -Ethylthio--Butylthio-	-Amino	-Substituted phenyl azo-	-Amino	--	Yellow to Orange	Azo dyes	137
8. -Phenyl	$-NH(CH_2)_3OH$ -Amino	-Substituted -phenylazo	$-NH(CH_2)_3OH$ -Amino	Produces golden yellow shades on nylon and wool and polyester	Yellow to Orange	Azo dyes	138,153
9. -N,N'-diethyl-amino	-(2-hydroxy ethyl) amino	-Substituted phenylazo	-(2-hydroxy ethyl) amino -	Produces bright scarlet shades on aromatic polyester textiles with excellent fastness to washing, light and pH changes	Scarlet λ_{max} ($CHCl_3$) = 500 nm	Disperse azo dyes	139
10. -H	-Methylamino	-Phenylazo -	-Methylamino	--	--	Anticoccidials	140
11. -Ethylthio	-Amino	-Substituted phenylazo	-Amino	Produces bright greenish to mid-yellow shades on polyester fibres	Greenish to mid-yellow	Disperse azo dyes	141

12. -Ethylthio	-Amino	-Substituted phenyl or heterocyclylazo	-Amino	Produces bright yellow to red shades on polyester fibres	Yellow or Red	Disperse azo dye	142
13. -Ethylthio	-Amino	-Substituted phenyl azo sulfonic acids	-Amino	Produces bright greenish yellow shades on polyamide fibres	Yellow	Azo dyes	143
14. -H	-Amino	-Phenylazo	-Amino	—	--	Intermediates for the synthesis of purine and its derivatives	144,145, 146,147, 148,149, 150,151, 152,155, 156
15. - Phenyl - Dibutylamino- 1-Pyrrolidinyl-	$-NH(CH_2)_3OH$ $-NH.CH_2CH_2OH$ $-NH.CH_2CH_2OMe$	Substituted phenyl azo sulfonic acids	$-NH(CH_2)_3OEt$ $-NH(CH_2)_3OSO_3H$ $-NH.CH_2CH_2OH$ $-NH.CH_2CH_2OMe$	Produces light and wet fast yellow to red shades on polyamide fibres	Yellow to Red	Azo dye	154

Table 6 : Halogenated pyrimidines and derivatives

S. No.	General formula	A	B	X	Y	Z	R	Properties	Colour & spectral data	Uses	Ref.
1.	1,3,4[A][(RNCONCR) $B^{+}SO_2Y$][(AX)$_{1-2}$NRZ]	-(un)substituted phenyl or naphthyl	-C_{2-8} alkylene optionally contg O- or imino group	-(un)substituted phenylene- or naphthylene	-$CH{:}CH_2$ contg. alkali removable group	-Tetrachloro pyrimidine group	-H -C_{1-4} alkyl, phenyl	Produces light and wet fast yellow shades on cotton	Yellow	Reactive azo dye	157
2.	XNRZ[A][ZNRY]$_{1-2}$	-Chromophoric group	--	-2,6-difluoro-4-pyrimidinyl amino-	-Heterocyclic fibre reactive group	-Direct bond or bridging group	-H -(un)substituted C_{1-6} alkyl	Produces red shades on cotton	Red $\lambda_{max}(H_2O)$: 515, 532 nm	Rective azo dye	158
3.	Y[A]X	-Azo or anthra quinone chromophore	--	-2,6-difluoro-4-pyrimidinyl-amino	-substituted phenylazo-phenyl	--	--	Imparts fast golden yellow shades on cotton	Yellow λ_{max}: 395.2 nm	Reactive azo dye	160,179, 191
4.	[A][Metal complex]--[B][X] [A]	-(un)substituted phenylring which forms formazan complexes with metal atoms	-(un)substituted phenyl ring which takes part in formazan complexation	-Trifluro-pyrimidine residue	--	--	--	Produces blue shades on cotton	Blue λ_{max} (H_2O): 614.6 nm	Fibre reactive formazan dyes	159,218, 232,178, 187,189
5.	ANR[1,3,5-Triazine]-NRZNRY	-Chromophoric group	--	--	-Chloro,fluoro or difluoro-pyrimidinyl	-Org. bridging group	-H -(un)substituted C_{1-4} alkyl	Imparts fast brilliant reddish-blue shades on cotton	Red λ_{max}: 583, 621 nm	Reactive dyes	161,210

6.	$[XO_2SZ]_{1-2}$- $-A[ZN(R)Y]_{1-2}$	-Azo, anthraquinone, phthalocyanine, formazan, azomethine, Benzodioxazine, Xanthene chromophore	--	$-CH_2$:CH or precursor	di; or trifluoro pyrimidinyl-dichloro, difluoro pyrimidinyl	--Bridging group or direct link	-Optionally substituted alkyl	Produces bluish red shades on cotton	Red-scarlet	Reactive dyes	162,186, 195,199, 203,204, 205,207, 208,211, 214
7.	[A]BXZ	-Substituted Cu, Ni, Co, Fe, or Al-phthalo cyanine chromophore	-Pyridone azo-; phenyl azo-; pyrazolone	2-6-dichloro 5-cyano-4-pyrimidinyl; amino, chloro, fluoro pyrimidine substituent	--	Direct bond optionally substituted C_{1-6} alkylene or phenylene	--	Produces light fast brilliant green shades on cotton	Green	Reactive phthalo cyanine dyes	163,165
8.	[A]BX	-(un)substituted naphthalene disulfonic acid, azo chromophore, phenylazo, (un)-substituted anthraquinone disulfonic acid residue	-(un)substituted naphthylamine sulfonic acid residue; -(un)substituted phenyl	-2,4-difluoro-5-chloro-6-pyrimidinyl; 5-chloro-4-fluoro-6-pyrimidinyl	--	--	--	1.Solid dyes are obtained from aq. solns. by passing through a semipermeable membrane of polyamide/polysulfone to remove salt 2.Produces orange shades on cotton	Orange λ_{max}:522nm	Reactive dyes	164,166, 261,262, 259

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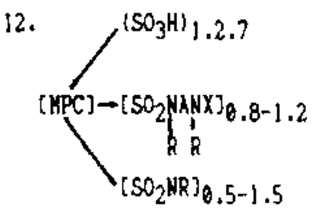
9.	$[XO_2SZ)_{1-2}A[ZB$ (halotriazine)-$(SO_2ZY)_{1-2}$	-Chromophoric residue	--	-alkali cleavable $CH{:}CH_2$ group	-2.6-difluoro-5-chloro-4-pyrimidinyl amino	--Direct bond; Divalent bridging group. Divalent arom or aliph. bridging group	-H -(un)substituted C_{1-4} alkyl	Produces fast greenish yellow shades on cotton.	Yellow	Reactive dyes	167,168, 197
10.	[XR]AZB	-Chromophoric residue	-(un)substituted pyridone azo	-5-chloro-2,6-difluoro-4-pyrimidinyl; 5-chloro-4,6-difluoro-pyrimidinyl	--	Direct bond or bridging group	-H C_{1-4} alkyl	1. Produces greenish yellow shade on cotton with resistant to light oxidn. & acid hydrolysis. 2. Produces red shades on cotton	Yellow-Red λ_{max}:514nm	Reactive dyes	169,170, 172,176
11.	[AN=N(3)(4),NHCO $(CH_2)_{1-2}$-OSO_3H-C_6H_3NHX]	-Substituted phenylazo	--	-5-chloro-2,6-difluoro-4-pyrimidinyl	--	--	--	Produces brilliant golden yellow shadeson cotton	Yellow λ_{max} (H_2O): 394 nm	Azo dyes	171
12.	 MPC = Cu or Ni phthalocyanine residue	-(un)substituted divalent aliph. residue; (un)-substituted phenylene residue	--	--	--	--	-H -(un)substituted C_{1-4}-alkyl, (un)substituted C_{2-4} alkylene; R^1=H, (un)substituted aliph. or aromatic residue	Produces fast turquoise shades on cotton fabrics	--	Reactive metal phthalocyanine dyes	174,177, 182,193, 194,198, 209,216, 254

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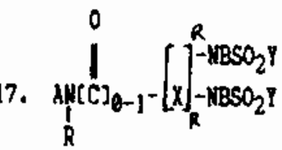
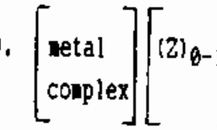
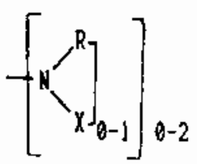
13.	[DMZAB]	-Substituted phenylazo	-Substituted pyridone residue	-2,4-dichloro-5-cyano-6-pyrimidinyl, 5-chloro-2,4-difluoro-6-pyrimidinyl amino	--	-Bridging group	--	Produces greenish yellow shades on cotton fabrics	Yellow	Reactive azo dyes	175,233 173
14.	A[(ZNR)N(halotriazine)zx]$_g$	-Chromophoric residue possibly contg. an additional reactive group	--	-2,4-dichloro 5-cyano-6-pyrimidinyl	--	-Bridging group	C_{2-4} alkylene	Produces fast orange shades on cotton	Orange	Reactive dyes	180
15.	[AN=NB]NRX	-(un)substituted naphthylazo-metal salts; substituted phenylazo; Anthraquinonylazo	-(un)substituted naphthylamine sulfonic acid residue	-2,4-dichloro-5-cyano-6-pyrimidinyl; 2,6-difluoro 5-chloro-6-pyrimidinyl; 2-fluoro-5-chloro-4-methyl -6-pyrimidinyl	--	--	-H $-C_{1-4}$ alkyl	1.Produces fast dark blue shades on cotton and rayon fibres. 2.Produces green-blue shades on cotton	Blue λ_{max} [1:1 AcOH-H_2O]: 581 nm	Metal complex reactive azo dyes	181,183, 184,202, 215,236, 237,239, 240,245, 246,252

16.	A-[NR-X]$_{1-2}$	-Chromophoric residue	--	-2,4-dichloro-5-formyl-6-pyrimidinyl,2-chloro-4-[(β,β' chloroethyl sulfonyl) ethylamino carbonyl phenyl]; 5-methyl sulfonyl-6-pyrimidinyl	--	--	-H -(un)substituted C_{1-4} alkyl	1.Produces fast greenish yellow shades on cotton 2.Produces fast bluish red shades on cotton	1. Yellow 2. Red λ_{max} = 530 nm	Reactive dyes	185,190, 188,242, 243,247
17.		-Chromophoric residue	-(un)substituted phenylene, naphthylene	-2,4,6-trifluoro-5-chloro-pyrimidine	-Alkali removable CH_2:CH_2 group, vinyl	--	-H -(un)substituted alkyl	--	λ_{max}: 540 nm	Reactive dyes	192
18.		-Chromophoric residue	--	-2,4-difluoro-5-chloro-6-pyrimidinyl	--	--	-H -C_{1-4} alkyl	Produces strong green yellow shades on cotton	Greenish yellow	Reactive dyes	196
19.		--	--	-2,4-difluoro-5-chloro-6-pyrimidinyl	--	-Direct bond, bridging group	-H -(un)substituted C_{1-4} alkyl	Produces fast green shades on cellulose materials	Green λ_{max}=642nm	Metal complex reactive dyes	201
											

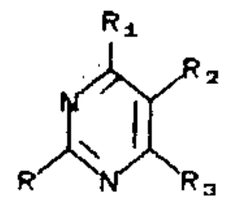
20.	XRNZ[A]ZNRX	-Substituted triphenodioxazine residue	--	-2,4-difluoro-5-chloro-6-pyrimidinyl	--	-Bridging group	-H -(un)substituted C_{1-6} alkyl, cycloalkyl,aryl, aralkyl	Produces clear blue shades on cotton	Blue λ_{max} (H_2O) 614 nm	Reactive dyes	206,212, 213
21.	AZNR[X]OSY[X]NR2A	-Org. dye residue	--	-5-chloro-2,6-difluoro-4-pyrimidinyl-group	-Bivalent aliph; araliph; arom; or heterocyclic group	-Direct bond bridging group	-H -(un)substituted C_{1-4} alkyl	Produces bluish red shades on cotton	Bluish red	Reactive azo dyes	217
22.	$(BSO_2)_{1-2}A[NR-X]_{1-2}$	-Dye residue	-Vinyl 2-sulfato ethyl; 2-thiosulfatoethyl; 2-chloro ethyl, or 2-acetoxy ethyl group	-5-chloro-2,4-difluoro pyrimidinylamino; or 5-chloro-2,4-difluoro pyrimidinyl-amino group linked to N-contg. bridging group	--	--	-H -(un)substituted C_{1-4} alkyl	1.Produces fast bluish-red shades on cellulosic fibres 2.Produces brown shades on cotton	Bluish-red, yellow to red or brown	Reactive azo dyes	219,220, 221,229, 234,248
23.	XNRZNH-[Substituted Triphenodioxazine Residue]-NHZNRX	--	--	-Substituted sulfotriazinyl or disulfo-pyrimidinyl	--	-(un)substituted C_{2-6} alkylene	-H -(un)substituted C_{1-4} alkyl	Produces fast shades on cellulosic fibres	λ_{max}=620nm	Reactive dyes	222

24.	$[XR^1YS(O)_{0-2}Z]_A[B]_A$ $[ZS(O)_{0-2}NYRX]_{0-1}$	-Benzene, Naphthalene or heterocyclic radicals optionally contg. addnl. azo group	-Substituted naphthalene sulfonic acid residue	-5-chloro 2,4-di-fluoro pyrimidinyl-residue	-(un)substituted alkylene	-Direct bond or bridging group	-(un)substituted C_{1-4} alkyl, C_{2-4} alkylene or phenyl-alkylene	Produces fast greenish blue shades on cotton	Navy blue-green to black λ_{max} (H_2O): 620 nm	Polyazo reactive dyes	223
25.	$A[NR^1XNR^2ZSO_2Y]_{1-2}$	-Org. dye residue	--	-2,4,6-trifluoro-5-methyl sulfonyl pyrimidine residue	$-CH{:}CH_2$ or $CH_2CH_2X^-$ (X=alkali cleavable org. or inorganic substituent	-Arylene or C_{2-6} alkylene	-H (un)substituted C_{1-4} alkyl, (un)substituted hydrocarbyl	Produces gloden yellow shades on cotton	Yellow	Reactive azo dye	224
26.	$A[ZNR-X]_{1-2}$	-Org. dye residue	--	-4,6-difluoro-5-chloro; 2-fluoro-dichloro-methyl pyrimidinyl amino	--	-Direct bond or bridging group	-H -alkyl	Produces yellow shades on cotton	Yellow	Rective dyes	225,230, 238,256, 258
27.	$A[ZNR-[X]-NR^2R^3]_{1-4}$	-Org. dye residue	--	-5-chloro-2,6-difluoro-4-(3-sulfophenyl-amino) pyrimidinylresidue	--	-Direct bond or bridging group	-H -(un)substituted C_{1-4} alkyl; R^2=H, (un)substituted alkyl, aryl, or (un)substituted heterocyclic group, R^3=H or (un)substituted alkyl	Produces blue dyeings and printings on cotton	Blue	Reactive dyes	226

28.	$AZS(O)_{0-2}CH_2CH_2NRX$	-Org. dye radical	--	-5-chloro-2,4-difluoro-pyrimidinyl amino	--	-Direct bond or bridging group	-H -(un)substituted C_{1-4} alkyl, C_{2-6}-alkylene or benzylamino	Produces yellowish red shades on cotton	Red	Reactive dyes	227
29.	[Substituted xanthenes] - $(NRZX)_{1-2}$	--	--	-5-chloro-2,4-difluoro-pyrimidinyl-amino	--	-Direct link or bridging group	-H -alkyl	Produces fast-reddish blue shades on cotton	Red to Blue	Reactive amino Xanthene dyes	228
30.	$XNH(CH_2)_{0-1}$ ZN:NAN:NZ-$(CH_2)_{0-1}NHX$	-H acid, K acid, S acid, or J acid residue	--	-2,4-difluoro-5-chloro-6-pyrimidinylamino	--	-(un)substituted sulphophenylene or sulphonaphthylene	--	Produces fast navy blue dyeings and printings on cotton	Blue	Reactive disazo dyes	231,244
31.	$[AN{=}N{-}\overset{COCH_3}{\overset{|}{C}}H{-}B{\rightarrow}](ZNRX)_{1-2}$	-Diazo component residue	-(un)substituted heterocyclic ring	-5-chloro-2,4-difluoro-6-pyrimidinyl amino	--	-Direct bond or bridging group	-H -alkyl	Produces brown, yellow, orange, shades on cotton and wool	Yellow to Brown	Reactive azo dyes	235
32.	[A]NRCO-[X]	-Org. dye residue	--	-2,4,6-trichloro pyrimidine 5-carbonyl chloride residue	--	--	-H -(un)substituted C_{1-4} alkyl	Produces bluish red shades on cotton	Red	Reactive dyes	241

33.	XN[AN=NBN=NY]	-Substituted amino-sulphonic acid residue	-Substituted naphthylamino-sulphonic acid residue	-5-chloro-2,6-di-fluoropy-rimidinyl amino	-Sulfanilamide residue; Substituted naph-thelene sul-phonic acid residue	--	--	Produces marine blue shades on cotton	Blue	Reactive disazo dyes	249,253
34.	[AN=NB]NX	-Substituted phenyl pyrazolone residue	-Substituted phenylazo	-5-chloro-2,6-difluoro-pyrimidinyl amino	--	--	--	Produces clear yellow shades with good fastness properties on 50:50 wool-cot-ton fibre	Yellow	Rective dyes	250,251, 260
35.	$RZXNCH_2[A][B]$	-Substituted naph-thylazo sulpho-nic acid residue	-Phenyl, naph-thalene,pyra-zole, or pyri-done type coupler	-5-chloro-2,6-difluoro-pyrimidinyla-mino	--	-Direct bond or bridging group	-H $-C_{1-4}$ alkyl	Produces bril-liant yellow shades on cotton	Yellow	Reactive azo dyes	255,257

Table 7 : Miscellaneous Pyrimidine derivatives



S. No.	R	R^1	R^2	R^3	Properties	Colour and Spec. data	Uses	Ref.
1.	-(un)substituted C_{1-6}alkyl,C_{5-7} cycloalkyl; (un)-substituted alkyl, C_{6-10}aryl,C_{5-10}-(het)aryl,acyl, aryl sulfonyl, aminocarbonyl, aminosulfonyl, fluorosulfonyl, halogen,alkyl-thio, nitro, arylthio, amino	-(un)substituted C_{1-6}alkyl,C_{5-7} cycloalkyl; (un)-substituted alkyl, C_{6-10}aryl,C_{5-10}-(het)aryl,acyl, aryl sulfonyl, aminocarbonyl, aminosulfonyl, fluorosulfonyl, halogen,alkyl-thio, nitro, arylthio, amino	-Substituted phenylazo	-H -(un)substitu-ted alkyl,allyl, C_{5-10} het-aryl, aryl, halogen, cyano,carbamoyl-alkoxycarbamoyl	Images which shows a hue corresponding to yellow swop colour ref.	Yellow	As thermal colour proofing agents	263

2. -Phenyl	-Ethyl amino	-Substituted phenylazo or naphthylazo having a -OH or -COCH grp. ortho to the azo group. The azo group linked to a metal atom.	-Hydroxy-the oxygen of which linked to metal atom.	Fast red shades on leather, protein fibres, polyimide fibres, polyurethan fibres etc.	Red	Metal complex azo dyes	264
3. -Alkyl, Alkoxy, Halogen, Hydroxy-substituted phenyl	-Halogen, Amino, Alkoxy, Alkenyl substituted phenyl	-H	-Substituted phenyl	Improves light fastness of the dyed fibres	-	As light stabilizers for dyed fibres	265
4. -Cyanoimino, -Urea	-Hydroxy	-4-azo-4'[substituted naphthyl-azosulfonic acid] -Benzanilide,derivs	-Hydroxy	Fast brilliant neutral yellow shades on paper.	Yellow [λ_{max}:423 nm in 0.1% NaOH]	Anionic dis-azo dyes	266

5. -H -Phenyl -Substituted phenyl	-H	-Substituted naphthoxazole derivs.	-H	Brown shades	Brown			267
6. -Substituted thiosemicarbazide residue	-Methyl; -Phenyl	-Substituted phenylazo	-Methyl; -Phenyl	-	-	-		268
7. -Substituted coumarin derivs.	-H	-(un)substituted Benzoxazole derivs.	-H	Greenish yellow shades on polyester	Yellow	Disperse dyes		269
8. -Substituted phenyl	-Methyl -H -Hydroxy -C_{1-4}alkyl	-H	-Methyl -H -Hydroxy -C_{1-4}alkyl	Fluorescent whiteners	-	Fluorescent Brightners		270

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9. -[4-Vinyl(4'-styryl biphenyl)]	-H	-H	-H	Good whitening effect and good light fastness on polyester and polyamide substrates	Yellow	Fluorescent Brightners	271
10. -H -Alkyl; Cyclo-alkyl, Aralkyl or Aryl	-H alkyl, Cycloalkyl, Aralkyl or Aryl	-Alkyl, cycloalkyl, Aryl, Aralkyl or halogen	-H -Alkyl, Cyclo-alkyl, Aralkyl or Aryl	Yellow and orange shades on acrylic fibres	Yellow λ_{max} 426 nm, in 50% HOAc	Cationic hydrazone dyes	272, 273
11. -N,N-diethylamino	-Chloro	-Substituted Phenylazo	-2-hydroxyethyl amino	Bright orange dyeing with excellent fastness to washings & light on polyester textiles	Orange λ_{max} ($CHCl_3$): 449 nm	Disperse dyes	274
12. -N,N-diethylamino	-H -Optionally substituted hydrocarbyl or aryl amino	-Substituted phenylazo	-Chloro, -Optonally substituted hydrocarbyl	Yellow to Red shades on polyester fibres	Yellow to Red	Disperse azodyes	275

13. -Thio	-Methyl	-Substituted Phenylazo	-Methyl	Bactericidal activity	-	-		276
14. -Oxo	-H	-H	-Benzothiazole;Quinoline; 6-methyl-quinoline;6-methoxy-quinoline; pyridine residues linked through methine linkage	-	-	Cyanine dyes		277, 280
15. -Aminosulfonyl phenylazo benzoic acid	-Methyl	-H	-Methyl	-	-	-		278
16. -Methylthio	-Dimethylamino, -Methylamino, -Chloro	-H	-2-(1-Naphtholazo)-	-	-	-		279
17. -Amino, -Hydroxy	-Hydroxy; -Methyl	-Substituted phenylazo	-Methyl	-	-	-		281

18. -Hydroxy	-Methyl	-Substituted phenylazo	-Methyl, -p-methylphenyl	Bactericidal activity	-	-	282
19. -4-(4'-vinyl stilbene) derivs.	-Methoxy	-H	-Methoxy	Good whitening effect on polyester textiles	-	Fluorescent Brightners	283, 285
20. -Cyanoimino-	-Amino	-Sulfogroup free anthraquinone or heterocyclic anthraquinonyl azo	-Hydroxy	High colour strength and high resistance for baking enamels polyolefins, and printing inks	Yellow	Azo pigments	284
21. Alkylamino; Cycloalkylamino; Aryl amino, C_{1-4} alkyl amino	-Alkylamino, Cycloalkylamino, Arylamino	-Substituted phenylazo	-Alkylamino, Cycloalkylamino, Arylamino, C_{1-4}alkylamino	Orange to red coatings having good light fastness	Orange to Red	Dyes and pigments	286
22. -H	-5- or 7-memberod ring; substituted alkylamino	-[4-(Substituted phenylazo)]-(substituted naphthyl)azo	-H	Fast navy blue shades on cotton, polyester, and cotton-polyester blends	Blue	Disazo dyes	287

23. -H -C_{1-4} alkyl or phenyl	-A saturated heterocyclic radical	-Substituted phenylazo	-H C_{1-4}alkyl/or phenyl	Golden yellow shades on polyester having good light fastness and rubbing fastness	Yellow	Dyes	288
24. -H -Optionally substituted alkyl or phenyl or saturated cyclic amino group	-Amino	-Substituted phenylazo	-H -lower alkyl	Fast yellow shades on polyamide fibres	Yellow	Azo dyes	289
25. -H -Substituted pyrazole derivs.	-Hydroxy	-lower alkyl	-Lower alkyl; Optionally substituted aryl	Incorporated into photog. emulsions and shows stability in gelation	Red	Styryl dyes	290

Aim and Scope

An Extensive literature reports are available for the organic colouring compounds in particular those having a heterocyclic moiety such as amino pyridines, amino thiazoles, amino pyrimidines, amino benzothiazoles etc. Several dyes having such moieties have been synthesised and used for dyeing, printing and as pigments. Dyes having pyrimidine ring systems have been reported as reactive, disperse, acid and basic dyes[10,83,93,127,133,157,174]. Hence it is thought desirable to synthesize the dyes having pyrimidine nucleus for possible applications.

Present work

The thesis describes the synthesis and properties of azo pyrimidine dyes. These compounds are synthesised by coupling 4,6-Diamino-2-thio-, and 4,6-Diamino-2-methylthio pyrimidine with various diazonium salts at low temperature, in alkaline and acidic media, respectively. These dyes are purified by column chromatography and their purity was checked by HPLC and HPTLC. These dyes are characterized by melting points, ultra-violet and infrared spectra.

The thermodynamic ionization constants of substituted azo pyrimidine dyes are determined in 50% methanol-water medium at 25^{o}C by pH titration techniques. The correction for the non-aqueous medium has been made. The average pK_a values are accurate to ± 0.02 but not beyond ± 0.03 in any case.

Aim and Scope

An Extensive literature reports are available for the organic colouring compounds in particular those having a heterocyclic moiety such as amino pyridines, amino thiazoles, amino pyrimidines, amino benzothiazoles etc. Several dyes having such moieties have been synthesised and used for dyeing, printing and as pigments. Dyes having pyrimidine ring systems have been reported as reactive, disperse, acid and basic dyes[10,83,93,127,133,157,174]. Hence it is thought desirable to synthesize the dyes having pyrimidine nucleus for possible applications.

Present work

The thesis describes the synthesis and properties of azo pyrimidine dyes. These compounds are synthesised by coupling 4,6-Diamino-2-thio-, and 4,6-Diamino-2-methylthio pyrimidine with various diazonium salts at low temperature, in alkaline and acidic media, respectively. These dyes are purified by column chromatography and their purity was checked by HPLC and HPTLC. These dyes are characterized by melting points, ultra-violet and infrared spectra.

The thermodynamic ionization constants of substituted azo pyrimidine dyes are determined in 50% methanol-water medium at 25°C by pH titration techniques. The correction for the non-aqueous medium has been made. The average pK_a values are accurate to ± 0.02 but not beyond ± 0.03 in any case.

A method for the determination of purity and dye content (azo group) is described. The dye samples are subjected to reduction with titanium trichloride and the excess titanium trichloride was back titrated against iron ammonium sulphate using potassium thiocyanate as an indicator.

A sensitive potentiometric method for the submicrogram determination of amine in dyes and intermediates is described. The dye samples are titrated with sodium nitrite potentiometrically using platinum and calomel electrodes.

The method for the determination of the colour strength of a dye in relation to that of the standard dye by means of reflectance measurements is described. Their L, a^*, b^* values as well as the colour difference values such as ΔL, Δa^*, Δb^*, ΔC, ΔH, the hue and total colour were ascertained.

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